BOOT LAKE

Oconto County

2016 Fish Management Report

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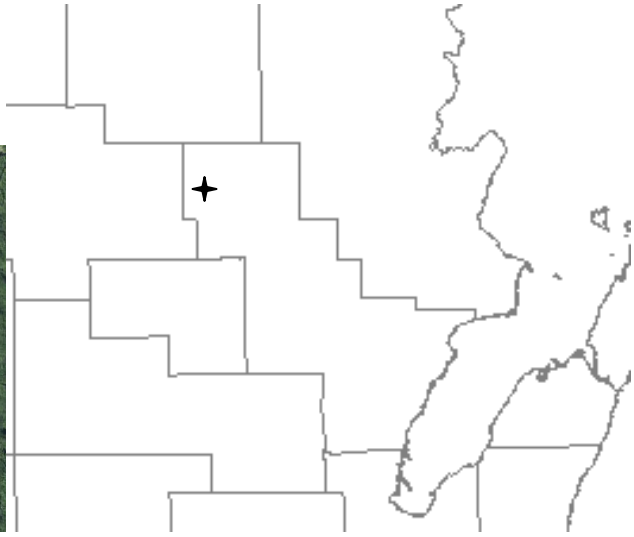

Wisconsin Department of Natural Resources

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2017

Boot Lake - Oconto County, Wisconsin
2016 Fish Management Report

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SUMMARY

Lake and location:
Boot Lake, Oconto County, T32N R15E Sec 9

Physical / chemical attributes (Wisconsin DNR, 1977):
Surface acres: 235
Maximum depth (ft): 38
Average depth (ft): 19
Shoreline length (mi): 3.7
Lake type: Seepage
Basic water chemistry: Medium hard water seepage lake having slightly alkaline, clear water of moderate transparency.
Littoral substrate: 55% sand, 20% muck, 10% rubble and 5% gravel.
Aquatic vegetation: Sparse
Other features: Boot Lake is moderately developed with homes along the south and east shorelines. The north shore is owned by the U.S. Forest Service and includes a boat launch, beach and 36-site campground. Boot Lake is located within the Ceded Territory.

Purpose of survey:
Determine the current status of fishery.

Surveys:
WDNR Survey ID: 515081133 – Spring fyke netting: 4/18/2016 to 4/25/2016
WDNR Survey ID: 515081133 – Early Spring WAE MUE (SEI): 4/27/2016
WDNR Survey ID: 515081628 – Gamefish/Panfish electrofishing (SEII): 6/22/2016
WDNR Survey ID: 515081622 – Summer Panfish netting: 6/27/2016 to 6/30/2016
WDNR Survey ID: 515082354 – Mini-fyke netting: 8/18/2016 – 8/19/2016
WDNR Survey ID: 515082354 – Fall recruitment survey WAE MUE: 10/11/2016

Fishery:

The fishery of Boot Lake is comprised of panfish species (bluegill, black crappie, pumpkinseed, yellow perch and rock bass) and gamefish species (walleye, smallmouth bass, largemouth bass, muskellunge and northern pike).

EXECUTIVE SUMMARY

- Boot Lake is a 235-acre seepage lake located in northwestern Oconto County and averages 19 feet deep. The United States Forest Service (USFS) owns and operates the boat landing, a beach and campground adjacent to the lake. Boot Lake is in the Ceded Territory (22,400 square miles of northern Wisconsin that was ceded to the United States by the Lake Superior Chippewa Tribes in 1837 and 1842) and therefore eligible for tribal, off-reservation harvest.
- Overall, 1,543 fish representing 10 species were collected during the 2016 sampling season (Table 4). The five most abundant species collected by number were yellow perch (42%), rock bass (19%), bluegill (19%), walleye (7%), and largemouth bass (7%).
- A total of 641 yellow perch was collected which accounted for 42% of our sample (Table 4). Yellow perch ranged in length from 5.6 to 12.3 inches and averaged 9.0 inches (Figure 1). Almost all perch were collected during the spring fyke netting (CPUE = 11.4/NN). Age-4 yellow perch averaged 7.7 inches and age-6 perch averaged 9.7 inches (Figure 2).
- During the survey, 287 bluegill were collected (Table 4) and ranged in length from 2.2 to 8.8 inches (Figure 5). Overall, 47% of the bluegill measured were 6.0 in or greater and considered harvestable (Figure 5). Bluegill PSD was 29 and RSD^P was 0; these values are from the June, SEII electrofishing sample. Age-6 bluegill averaged 6.4 in and bluegill were reaching a harvestable size between age 5 and age 6 (Figure 6).
- One hundred eleven walleye were collected during the 2016 survey and ranged in length from 8.0 to 21.0 (Figure 7). A total of 70 walleye (including 10 recaptures) was collected during the spring fyke netting survey with a mean catch per net night of 1.2/NN (Figure 8 & Table 5). The population estimate for all walleye was 248 fish or approximately 1.1 walleye/acre. A subsample of 70 walleye from fyke nets was aged from 4 to 14 years old. Walleye were reaching legal size (18 in) by age 6 (Figure 9). Compared to the average length at age for northern Wisconsin, walleye growth was average at all ages (Figure 9).
- A total of 108 largemouth bass was collected during the 2016 fisheries survey and accounted for 7% of the fish collected (Table 4). Bass ranged in length from 4.9 to 21.3 in and averaged 12.1 inches across all 2016 samples (Figures 10 & 11). Ten percent of largemouth bass collected during the SEII survey were over the 14-inch minimum length limit (Figure 10). Largemouth bass are reaching legal size (14 inches) around age 7. Largemouth bass growth was average until age 7 but below average at older ages compared to the average mean length at age for bass in northern Wisconsin (Figure 12).
- Six adult muskies and 1 juvenile were collected during the spring fyke netting in 2016 (Table 4 & Figure 14). The last muskellunge stocking in Boot Lake occurred in 1990. Therefore the remnant population is a result of limited natural reproduction. Stocking resumed in 2014 and survival of stocked fish appears to be good (Table 8 & Figure 14).
- Until 2016, no confirmed collections of smallmouth bass had been recorded since 1948 but 3 smallmouth were collected in 2016 (Table 4). Prior to this survey, the Boot Lake Association expressed an interest in stocking smallmouth. The Association stocked smallmouth in 2016 and is planning to stock again in 2018 and 2020.
- In 2015, the minimum length limit for walleye was increased from 15 inches to 18 inches and the daily bag limit is 3 fish/angler/day. This regulation will allow a significant number of sexually mature adults an increased opportunity to spawn (Figures 7 & 8). This is especially significant since the walleye fishery had been maintained mostly through natural reproduction. Regular stockings of walleye began around 2000 (Table 1). Therefore, until another

population estimate occurs, alternate year stockings of large fingerlings walleye should continue at the rate of 5 fish/acre but regular, routine monitoring should also continue to evaluate the contribution of stocking to the fishery.

- Fishing regulations for black bass were changed in the northern bass zone in 2014 (whereby largemouth bass are no longer protected under the early catch-and-release season from the first Saturday in May to the second Saturday in June). If the stockings of smallmouth bass are successful and we observe increased reproduction and recruitment, increasing the minimum length limit on smallmouth bass from 14 to 18 inches will be recommended. Added protection for smallmouth bass would be justified in light of the infestation of Boot Lake by rusty crayfish.
- In 2014, C & R Musky Club (CRMC) approached the WDNR about stocking muskellunge in Boot Lake. In 2014, 2015, and 2016 CRMC purchased between 200 and 275 muskellunge for stocking (Table 1). WDNR fin clipped (LV = left ventral) all fish prior to scatter planting to monitor natural reproduction in future surveys. Approximately 10% of these muskellunge were also PIT tagged each year so that future estimates of growth could be obtained. CRMC has tentatively agreed to stock muskellunge at the rate of 1 fish/acre in Boot Lake annually until 2024. If these stockings produce an appreciable increase in adult muskellunge and natural reproduction improves, then WDNR should consider taking over muskellunge stocking in Boot Lake.
- The next comprehensive fisheries survey (spring fyke netting, SEI electrofishing, summer panfish fyke netting, mini fyke netting, SEII electrofishing, and fall electrofishing) of Boot Lake is scheduled for 2024 and will focus on the age, growth, abundance, and recruitment of the dominant gamefish.
- An angler creel survey was conducted by WDNR during the 2016/2017 fishing season. The results from this survey will be available later in 2017.

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INTRODUCTION

Boot Lake is a 235-acre seepage lake located in northwestern Oconto County. The lake has a maximum depth of 38 feet but averages 19 feet deep. Boot Lake is one of the larger lakes in the immediate area and offers a variety of recreational opportunities in addition to fishing. The United States Forest Service (USFS) owns and operates the boat landing, beach and campground. Additionally, the USFS owns the entire north shoreline of the lake.

Boot Lake is in the Ceded Territory (22,400 square miles of northern Wisconsin that was ceded to the United States by the Lake Superior Chippewa Tribes in 1837 and 1842) and therefore eligible for tribal, off-reservation spearing harvest of gamefish but most notably, walleye. The Wisconsin Department of Natural Resources (WDNR) stocked small fingerling walleye every other year between 2000 and 2012 (Table 1). A study to determine the level of walleye natural reproduction was completed between 2008 and 2012 by stocking small fingerling walleye marked with oxytetracycline (OTC). Beginning in 2013, and again in 2015, large fingerling walleye were stocked under the Wisconsin Walleye Initiative (Table 1).

Muskellunge were stocked by WDNR throughout the 1970's and late 1980's. In 2014, Catch & Release Musky Club (CRMC) from Appleton, Wisconsin approached WDNR staff about stocking Boot Lake with muskellunge. A plan was developed for the club to stock approximately 1 fish per acre for 10 years. All fish to date have been fin clipped before stocking and approximately 10% of the stocked fish were PIT tagged each year.

Finally, in 2016 the Boot Lake Association expressed interested in reestablishing a smallmouth bass fishery and purchased 1,000 fish for stocking. The Boot Lake Association agreed to stock smallmouth again in 2018 and 2020 so this effort could be evaluated during the next comprehensive fisheries survey.

The last fisheries survey of Boot Lake was conducted in 1996 (Heizer, 1997). The 1996 survey consisted of 39 net nights (NN) of fyke netting in early May, shoreline electrofishing was in both the spring and fall, and 3 NN of summer panfish netting. The 1996 survey generated a walleye population estimate of 2.3 walleye per acre and noted a healthy largemouth bass population (Heizer, 1997). The panfish population in 1996 was dominated by yellow perch followed by rock bass and bluegill (Heizer, 1997). No changes (stocking or fishing regulations) were recommended at that time.

The goal of the 2016 comprehensive fisheries survey was to assess the status of the fishery by characterizing gamefish populations based on relative abundance, proportional stock density (PSD), relative stock density (RSD), catch per unit effort (CPUE) and mean length at capture (age and growth).

METHODS

Data collection:

Standard fyke nets (3-foot hoop, $^{3}/_{4}$-bar, 1.5-inch stretch), mini-fyke nets ($^{1}/_{4}$-inch stretch with turtle exclusion) and a standard WDNR electrofishing boat were used to collect fish on Boot Lake. Sampling gear, effort, date, and target species for the survey are listed in Table 2. A map of spring fyke netting locations is located in Appendix 3; Figure 15. All gamefish fish collected were measured to the nearest 0.1 inch total length (TL). Not all panfish were measured; representative samples were taken to reduce handling mortality from a net or electrofishing run when the sample size was large. A sub-sample of scales or dorsal spines was collected for age and growth analysis from gamefish and panfish. Aging structures (scales or spines) were collected from 5 non young-of-the-year (YOY) fish per half inch group. If gender could be determined, structures from 5 fish per sex were collected per half inch group. Ages were assigned to each fish using standard WDNR procedures.

Data analysis:

Relative abundance was calculated as the percentage each species represented from the total sample (i.e. 22 fish of a single species from a sample of 100 total fish = 22% relative abundance). Catch per unit effort (CPUE) was calculated as catch by gear divided by sampling effort for each species collected. Length frequency distributions were tabulated for dominant gamefish and consisted of combined April and June electrofishing samples as well as fyke net data. Proportional stock density (PSD) and relative stock density for **p**referred length fish (RSD^{P}) were calculated for dominant gamefish (Table 3; Anderson and Neumann 1996). Preferred lengths of various gamefish have a minimum length between 45 and 55% of the world record length for that species (Anderson and Neumann 1996). Stock, quality, and preferred lengths were used as proposed by Gabelhouse (1984). PSD and RSD^{P} ranges for balanced populations of gamefish and panfish are listed in Table 3. Mean length at capture data was calculated for dominant gamefish and compared to the average of mean length at age for northern Wisconsin.

A population estimate for walleye was obtained during the spring fyke net survey by giving each captured fish a top caudal fin clip. Marks (fin clips) were noted is subsequent collections until the survey was complete. Bailey's modification (sampling during the recapture period is conducted with replacement) of the Peterson index was used to generate a population estimate since the number of fish sampled was low (Van Den Avyle & Hayward, 1999).

RESULTS

Overall, 1,543 fish representing 10 species were collected during the 2016 sampling season (Table 4). The five most abundant species collected by number were yellow perch (42%), rock bass (19%), bluegill (19%), walleye (7%), and largemouth bass (7%).

A total of 641 yellow perch was collected which accounted for 42% of our sample (Table 4). More than half of all yellow perch were measured (351) and ranged in length from 5.6 to 12.3 inches and averaged 9.0 inches (Figure 1). Six hundred thirty-seven perch were collected during the spring fyke netting (CPUE = 11.4/NN) and 5 during the summer panfish netting (Tables 5 & 6). No perch were collected during the summer, SEII electrofishing survey (Table 7). Yellow perch PSD was 77 and RSD^{P} was 23 (23% $\geq$ 10 inches). Perch PSD was above the desirable range for a balanced population (Table 3). A subsample of 65 perch was aged from 3 to 12 years old. Age-4 yellow perch averaged 7.7 inches and age-6 perch averaged 9.7 inches (Figure 2). Growth was above average until age 6 but remained only slightly above average at older ages compared to the mean length at age of yellow perch in northern Wisconsin (Figure 2). Successful reproduction and recruitment was evident.

Rock bass made up 19% of the fish collected totaling 298 fish (Table 4). Rock bass ranged in length from 4.6 to 11.0 inches and averaged 7.5 inches (Figures 3 & 4). Electrofishing CPUE was 96.0/h; spring fyke netting CPUE was 3.1/NN, and summer fyke net CPUE was 9.9/NN (Tables 5, 6, & 7). Overall, the length frequencies (Figures 3 & 4) suggest that the rock bass population is well balanced in terms of size structure. Reproduction and recruitment appear to be stable since 78 YOY and age-1 rock bass were collected in the mini fyke nets (Table 11).

During the survey, 287 bluegill were collected (Table 4). Electrofishing yielded a CPUE of 252.0/h, 1.0/NN during spring fyke netting and 5.9/NN during the summer panfish netting survey (Tables 5, 6, & 7). Bluegill ranged in length from 2.2 to 8.8 inches (Figure 5). Bluegill averaged 7.3 inches during spring fyke netting; 5.3 inches from the summer electrofishing sample; and 6.2

inches during summer panfish netting (Tables 5, 6, & 7). Only 219 bluegill were measured of the 287 bluegill collected. Overall, 47% of the bluegill measured were 6.0 in or greater and considered harvestable (Figure 5). Bluegill PSD was 29 and RSD^P was 0; these values are from the June, SEII electrofishing sample. While PSD was within the desirable range for a balanced population, RSD^P was not (Table 3). A subsample of 44 bluegill was aged from 3 to 8 years old. Age-6 bluegill averaged 6.4 in and reaching a harvestable size between age 5 and age 6 (Figure 6). Growth was average at all ages compared to the mean length at age of bluegill in northern Wisconsin (Figure 6). Successful reproduction and recruitment of bluegill was evident due to the number of YOY and age-1 bluegill (N = 323) collected during mini fyke netting (Table 11).

One hundred eleven walleye were collected during the 2016 survey (Table 4). In 2016 electrofishing for walleye was conducted in April and October with CPUE's of 15.5/h and 4.7/h, respectively (Table 7 & 8). Walleye ranged in length from 8.0 to 21.0 inches and averaged 17.8 inches during the April SEI survey (Figure 7). A total of 70 walleye (including 10 recaptures) was collected during the spring fyke netting survey with a mean catch per net night of 1.2/NN (Figure 8 & Table 5). Walleye PSD and RSD^P from the spring fyke net sample was 100 and 42. Walleye PSD was well above the desirable range of 30 to 60 (Table 3). The population estimate (Chapman's version of the Peterson Index) for all walleye was 248 fish (95% C.I. = 100 – 396) or approximately 1.1 walleye/acre. A subsample of 70 walleye from fyke nets was aged from 4 to 14 years old. Walleye were reaching legal size (18 in) by age 6 (Figure 9). Compared to the average length at age for northern Wisconsin, walleye growth was average at all ages (Figure 9).

A total of 108 largemouth bass was collected during the 2016 fisheries survey and accounted for 7% of the fish collected (Table 4). SEII electrofishing yielded a CPUE of 27.8/h and fyke netting a CPUE of 0.6/NN (Tables 5 & 7). Bass ranged in length from 4.9 to 21.3 in and averaged 12.1 inches across all 2016 samples (Figures 10 & 11). Largemouth bass PSD was 28 and RSD^P was 2 (from the SEII electrofishing sample). Bass PSD was within the desirable range for a balanced population however, RSD^P was not (Table 3). Ten percent of largemouth bass collected during the SEII survey were over the 14-inch minimum length limit (Figure 10). A subsample of 26 largemouth bass from the SEII survey was aged from 2 to 13 years old. Largemouth bass growth was average until age 7 but below average at older ages compared to the average mean length at age for bass in northern Wisconsin (Figure 12). Bass are reaching legal

size (14 inches) around age 7. Successful reproduction and recruitment of largemouth bass were evident judging from the length frequency and age at length (Figures 10, 11, & 12).

Northern pike made up 3% of the fish collected during the 2016 fisheries survey totaling 45 fish (Table 4). Pike ranged in length from 12.5 to 38.0 inches and averaged 20.2 inches across all samples (Figure 13). Northern pike electrofishing (SEI) and fyke netting CPUE were 5.5/h and 0.3/NN, respectively (Tables 5 & 7). Pike PSD and RSD^P from the spring fyke netting survey were 65 and 35, respectively. Pike PSD was above the desirable range of 30 to 60 (Table 3). No northern pike were aged from this survey. Due to the lack of recaptures during the fyke netting survey, a population estimate was not calculated.

Six adult muskies and 1 juvenile were collected during the spring fyke netting in 2016 (Table 4 & Figure 14). Spring and fall electrofishing has produced mixed results over the past decade (Tables 7 & 8). The last muskellunge stocking in Boot Lake occurred in 1990. Therefore the remnant population is a result of limited natural reproduction. Stocking resumed in 2014 and survival of stocked fish appears to be good based on fall YOY CPUE in 2015 and 2016.

Additionally, pumpkinseed sunfish, black crappie, and smallmouth bass were also collected during the 2015 survey and accounted for approximately 3% of the remaining fish collected (Table 4).

DISCUSSION

Boot Lake is relatively infertile because it is a seepage lake and it has a small upland, forested watershed. Populations of panfish (yellow perch, bluegill and rock bass) and gamefish (walleye, largemouth bass, northern pike and muskellunge) are present and offer anglers a respectable fishing opportunity.

Since the previous fisheries survey in 1996, fish sampling protocols were evaluated and changed; specifically the timing of gamefish/panfish electrofishing (SEII). In 1996, SEII sampling was conducted in the fall (i.e. October) where as in current survey, SEII electrofishing was conducted in June. Therefore, it's difficult to detect changes in gamefish populations (specifically bass and panfish) between SEII electrofishing surveys. Viable comparisons between years/surveys can still be made between spring (SEI) and fall electrofishing, as well as fyke netting surveys. Additionally, no age and growth data was available from the 1996 surveys therefore; no growth comparisons can be made between years.

Yellow perch were by far the most abundant panfish species collected in both 1996 and 2016 (Tables 4 & 5). Not only did the total number of perch collected during spring fyke netting increase between years, the average length of perch increased from 7.3 inches in 1996 to 9.0 inches in 2016 (Figure 1). Perch PSD improved from 30 in 1996 to 77 in 2016 and RSD^P increased from 2 to 23 between 1996 and 2016, respectively (Table 3). Essentially, there appear to be more and larger perch available in 2016 than in 1996.

Rock bass abundance has increased substantially between 1996 and 2016 (Tables 5 & 6). Spring fyke netting CPUE for rock bass increased to 3.1/NN in 2016 from only 0.4/NN in 1996 (Table 5 & Figure 3). On the other hand, summer fyke netting CPUE decreased from 11.7/NN in 1996 to 9.9/NN in 2016 but sampling effort and total catch were much less in 1996 than in 2016 (Table 6 & Figure 4). Seventy-eight rock bass were also collected in the mini fyke nets (Table 10). Therefore, rock bass abundance has definitely increased since the last survey.

Bluegill was the third most abundant panfish species collected during spring fyke netting, the second most abundant during the summer panfish fyke netting, and the most abundant during the mini fyke netting survey and SEII electrofishing survey (Tables 5, 6, 7, and 10). Summer panfish netting CPUE declined substantially between 1996 and 2016 from 65.3/NN to 5.9/NN, respectively but that is mostly and artifact of sampling since effort was much less in 1996 than in 2016 (Table 6 & Figure 5). Bluegill size structure improved between 1996 and 2016 and this was most evident from comparison of the summer panfish netting (Figure 5). PSD from the summer panfish netting increased from 25 in 1996 to 51 in 2016 and RSD^P was 7 in both years (Figure 5). Additionally, 323 bluegill (young-of-the-year (YOY) and age 1) were collected with mini fyke nets in August 2016 indicating good reproduction (Table 10).

Walleye were the most abundant gamefish collected during the 2016 fisheries survey (Table 4). However, spring electrofishing CPUE dropped from 45.4/mile in 1996 to 8.3/mile in 2016 (Table 7) and spring fyke netting CPUE declined from 7.5/NN in 1996 to 1.2/NN in 2016 (Table 5). Consequently, adult walleye density also declined from 2.3/acre to 1.1/acre between 1996 and 2016. A creel survey conducted in 1996 on Boot Lake estimated the total catch of walleye to be 2,460 fish and total harvest was estimated to be 280 walleye. Most harvested walleye were between 15 and 18 inches. Harvest estimates from the 2016 angler creel survey were not available at the time this report was completed.

Boot Lake is also in the Ceded Territory (22,400 square miles of northern Wisconsin that was ceded to the United States by the Lake Superior Chippewa Tribes in 1837 and 1842) and therefore eligible for tribal, off-reservation spearing harvest. Between 1996 and 2016, 618 walleye have been harvested by tribal members (Table 11). Therefore, both recreational and tribal harvest are impacting the total number of adult walleye in the population. In 2015, new walleye fishing regulations were implemented. The previous regulation consisted of a 15-inch minimum length limit a daily bag limit that fluctuated based on tribal harvest declarations. The new minimum length limit was increased to 18 inches and the daily bag limit is 3 regardless of tribal harvest declarations. This regulation will allow a significant number of sexually mature adults between 15 and 18 inches an increased opportunity to spawn (Figures 7 & 8).

Walleye natural reproduction has sustained this population for many years. The 1996 survey revealed several strong year classes of walleye (Heizer, 1997). These strong year classes were the result of natural reproduction because no walleye stockings had taken place since 1988; 8 years before that survey (Table 1). Walleye recruitment was assessed by marking small fingerling walleye before stocking with oxytetracycline (OTC) in 2008, 2010, and 2012. YOY walleye were collected in the same year as stocking. Otoliths were removed and examined for marks. The subsequent proportion of marked to unmarked fish revealed that all walleye recruitment was the result of natural reproduction (e.g. no stocked, OTC marked fish were collected; Table 8). Even though some natural reproduction was also observed in 2015 and 2016 (Table 8), reproduction and recruitment are currently insufficient to sustain a quality walleye fishing opportunity.

In 2013, the Wisconsin Legislature appropriated funds to WDNR to begin the Wisconsin Walleye Initiative (WWI). This program has increased the production and distribution of large fingerling walleye throughout the State, including Boot Lake. Small fingerling walleye stockings began in Boot Lake back in 2000 (Table 1). As a result of the WWI, WDNR switched from stocking small fingerling walleye to stocking large fingerling walleye in 2013 and 2015 (Table 1). It is too soon to determine the contribution of the large fingerling walleye stockings to the fishery. However, the increase in the minimum length limit from 15 to 18 inches and continued stocking of large fingerling walleye will likely increase the adult density of walleye and potentially lead to improved natural reproduction before the next comprehensive fisheries survey in 2024.

Largemouth bass made up 7% of the fish collected but their overall abundance does not appear to have significantly increased since the 1996 survey (Tables 5 & 7). Between 1996 and

2016, largemouth bass CPUE increased slightly from 12.0/h to 12.8/h (Table 7). Largemouth PSD decreased from 48 to 28 between 1996 and 2016 and RSD^P also decreased from 12 to 2 between survey years. However, the timing of the electrofishing sample changed between surveys; the 2016 SEII electrofishing sample was collected in June whereas the 1996 sample was collected in October (Table 7). Therefore, detectable changes in abundance and size structure may be difficult to interpret between surveys.

Anecdotal accounts of smallmouth bass being caught at Boot Lake have been reported for years. Until 2016, no confirmed collections of smallmouth bass had been recorded since 1948. While only 3 smallmouth bass were collected in 2016 (Table 4), there are likely larger, sexually mature individuals present. Prior to this survey, the Boot Lake Association expressed an interest in stocking smallmouth bass to help bolster the population. Therefore, WDNR approved the stocking of 1,000, 5-inch smallmouth bass in 2016. The Boot Lake Association is planning to stock 1,000 smallmouth bass again in 2018 and 2020. Suitable or preferred habitat (rocky/rubble substrate) and ample forage (rusty crayfish) are present for smallmouth bass and it's anticipated that these stockings should be successful at increasing smallmouth abundance. However, our goal from these stockings is to ultimately increase the number of sexually mature adults in the populations thereby improving natural reproduction and recruitment. Future regulatory protection for smallmouth bass (i.e. an increase in the minimum length limit; reduced bag limit) may be necessary to reach our goal but this will not be evident until these stockings are evaluated during the next comprehensive survey.

In 2014, C & R Musky Club (CRMC) from Appleton, Wisconsin approached the WDNR about stocking muskellunge in Boot Lake. Since Boot Lake was already a designated muskellunge lake and had a history of stocking (Table 1), a plan was developed to revive this portion of the fishery. In 2014, 2015, and 2016 CRMC purchased between 200 and 275 muskellunge for stocking (Table 1). WDNR staff met the supplier at the landing and fin clipped (LV = left ventral) all fish prior to scatter planting to monitor natural reproduction in future surveys. Approximately 10% of these muskellunge were also PIT tagged each year so that future estimates of growth could be obtained. In April 2016, a PIT-tagged musky stocked in 2015 was recaptured during our SEI / spring electrofishing. This fish was 13.0 inches at stocking in September 2015 and was 13.8 inches when recaptured in April 2016. All juvenile muskies collected in 2015 and 2016 had a LV clip. Additionally, 2 LV clipped muskies were collected on 9/14/2015 (15.4 and 18.0 inches) from

the 2014 stocking; this sampling occurred 1 week prior to the 2015 stocking which took place on 9/21/2015. CRMC has tentatively agreed to stock muskellunge at the rate of 1 fish/acre in Boot Lake annually until 2024. If these stockings produce an appreciable increase in adult muskellunge and natural reproduction improves, then WDNR should consider taking over muskellunge stocking in Boot Lake.

A creel survey was conducted on Boot Lake during the 2016-2017 fishing season. A creel survey is an assessment tool used for sampling the fishing activities of anglers on a body of water and make projections of fish harvest. Creel survey clerks work on randomly-selected days and shifts, 40 hours/week during the fishing season except for November. These surveys are conducted during daylight hours and shift times change from month to month as day length changes. Creel survey clerks count anglers on the lake at predetermined times and interview anglers who have completed their fishing trip. Information such as what species anglers fished for, catch, harvest, fish lengths and hours of fishing effort are all collected. This data is used to make projections of total catch, harvest and fishing effort for the entire year. At the time of this report the angler creel survey was still being conducted therefore, the results cannot be included.

CONCLUSIONS & RECOMMENDATIONS

The current fishing regulations (Table 7) are adequate and should continue to provide quality fishing opportunities. Panfish abundance is stable even though catch rates declined somewhat between survey years (Table 6). Future surveys should continue to utilize summer panfish netting to characterize panfish populations, if time allows.

New walleye fishing regulations were implemented in 2015. The previous regulation consisted of a 15-inch minimum length limit and the daily bag limit fluctuated based on tribal harvest declarations. In 2015, the minimum length limit was increased to 18 inches and the daily bag limit is 3 regardless of tribal harvest declarations. This regulation will allow a significant number of sexually mature adults between 15 and 18 inches an increased opportunity to spawn (Figures 7 & 8). This is especially significant since the walleye fishery had been maintained mostly through natural reproduction until regular stocking began around 2000 (Table 1). Additionally, OTC marked small fingerling walleye stocked in 2008, 2010 and 2012 contributed little, if anything, to the walleye fishery. Ultimately, stocking may not be necessary to sustain the walleye fishery and as a result, the stocking of large fingerling walleye should be closely

monitored in the future. However, as the walleye fishery recovers in Boot Lake, recreational and tribal harvest are likely to increase. Therefore, alternate year stockings of large fingerlings walleye should continue at the rate of 5 fish/acre until another population estimate is generated. Regular, routine monitoring (i.e. YOY fall walleye evaluations) should also continue to evaluate the contribution of stocking to the fishery.

Fishing regulations for black bass were changed in the northern bass zone in 2014 (whereby largemouth bass are no longer protected under the early catch-and-release season from the first Saturday in May to the second Saturday in June). At this time, no changes are being proposed for largemouth or smallmouth bass. If the stockings of smallmouth bass are successful and we observe increased reproduction and recruitment, increasing the minimum length limit on smallmouth bass from 14 to 18 inches will be recommended. While the results from the 2016-2017 Boot Lake creel survey are not readily available, other creel surveys in other northern Oconto County lakes (Maiden Lake in 1999/2000; Wheeler Lake in 2008/2009) revealed that harvest of both largemouth and smallmouth bass is negligible. However, the added protection for smallmouth bass would be justified in light of the infestation of Boot Lake by rusty crayfish.

The next comprehensive fisheries survey (spring fyke netting, SEI electrofishing, summer panfish fyke netting, mini fyke netting, SEII electrofishing, and fall electrofishing) of Boot Lake is scheduled for 2024 and will focus on the age, growth, abundance, and recruitment of the dominant gamefish. Access to Boot Lake is adequate. A boat landing is available to anglers from the National Forest and offers ample parking and restrooms. Shore fishing opportunities are available from National Forest property at the campground and the entire north shore of the lake. Boaters are reminded to remove all vegetation from their boat and trailer before leaving to limit the spread of invasive species. A map of Boot Lake can be found at the following internet address; http://dnr.wi.gov/lakes/maps/DNR/0418700a.pdf

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APPENDIX I – TABLES

Table 1. Stocking history of Boot Lake; Oconto County, WI.

Year	Species	Age Class	Number Stocked	Avgerage Length	Source Type
1972	MUSKELLUNGE	FINGERLING	700	13.0	WDNR
1973	WALLEYE	FINGERLING	12000	5.0	WDNR
1974	MUSKELLUNGE	FINGERLING	958	5.0	WDNR
1975	MUSKELLUNGE	FINGERLING	500	11.0	WDNR
1976	WALLEYE	FINGERLING	12000	3.0	WDNR
1977	MUSKELLUNGE	FINGERLING	500	9.0	WDNR
1986	MUSKELLUNGE	FINGERLING	500	10.0	WDNR
1988	MUSKELLUNGE	FINGERLING	500	10.0	WDNR
1990	MUSKELLUNGE	FINGERLING	500	12.0	WDNR
2000	WALLEYE	SMALL FINGERLING	10000	1.7	WDNR
2003	WALLEYE	SMALL FINGERLING	9998	1.3	WDNR
2004	WALLEYE	SMALL FINGERLING	9995	2.0	WDNR
2006	WALLEYE	SMALL FINGERLING	9203	1.4	WDNR
2008	WALLEYE	SMALL FINGERLING	8269	1.4	WDNR
2010	WALLEYE	SMALL FINGERLING	8000	1.4	WDNR
2012	WALLEYE	SMALL FINGERLING	8225	1.6	WDNR
2013	WALLEYE	LARGE FINGERLING	2347	6.8	WDNR
2014	MUSKELLUNGE	YEARLING	200	10.0	PRIVATE HATCHERY
2015	MUSKELLUNGE	YEARLING	200	12.0	PRIVATE HATCHERY
2015	WALLEYE	LARGE FINGERLING	2302	7.7	WDNR
2016	MUSKELLUNGE	LARGE FINGERLING	275	13.0	PRIVATE HATCHERY
2016	SMALLMOUTH BASS	LARGE FINGERLING	1000	5.0	PRIVATE HATCHERY

Table 2. Sampling gear, date, target species, sampling effort, and location (distance) for the 2016 fisheries surveys on Boot Lake; Oconto County, WI.

Gear	Date	Target Species	Sampling Effort hours (h) or net night (NN)	Shoreline Distance (mi)
Fyke net	April 18, 2016 to April 25, 2016	All fish	56 NN	
Electrofishing	April 27, 2016	Gamefish	1.8 h	3.7
Electrofishing	June 22, 2016	Gamefish	0.5 h	1.0
		&		
		Panfish	1.3 h	4.0
Fyke net	June 27, 2016 to June 30, 2016	Panfish	18 NN	
Mini fyke net	August 18, 2016	YOY Panfish	8 NN	
Electrofishing	October 11, 2016	YOY WAE & MUE	1.8 h	3.7

Table 3. Proposed length categories for various fish species. Measurements are total lengths for each category in inches. Updated from Anderson and Neumann (1996), Bister et al. (2000), Hyatt and Hubert (2001).

Species	PSD	RSD-P	Stock	Quality	Preferred	Memorable	Trophy
Black crappie			5	8	10	12	15
Bluegill	20 - 40	5 - 20*	3	6	8	10	12
Brown bullhead			5	8	11	14	17
Largemouth bass	40 - 70	10 - 40*	8	12	15	20	25
Muskellunge	30 - 60		20	30	38	42	50
Northern pike	30 - 60		14	21	28	34	44
Pumpkinseed	20 - 40		3	6	8	10	12
Rock bass	20 - 60		4	7	9	11	13
Smallmouth bass	30 - 60		7	11	14	17	20
Walleye	30 - 60		10	15	20	25	30
Yellow perch	30 - 50		5	8	10	12	15
Yellow bullhead			4	7	9	11	14

*Range based on management strategy for balanced populations.

Table 4. Number, relative abundance (%), and length range (in) of fishes collected in 2016 from Boot Lake; Oconto County, WI.

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER			
*Common Name of Fish	Number	Percent	Length Range (inches)
Yellow perch	642	42%	5.6 - 12.3
Rock bass	298	19%	4.6 - 11.0
Bluegill	287	19%	2.2 - 8.8
Walleye**	111	7%	6.5 - 26.5
Largemouth bass	108	7%	4.9 - 21.3
Northern pike	45	3%	12.5 - 38.0
Pumpkinseed	24	2%	3.6 - 7.3
Muskellunge**	15	1%	13.1 - 51.7
Black crappie	10	1%	5.9 - 10.3
Smallmouth bass	3	0.2%	8.4 - 10.8
TOTAL***	1,543		

* Common names of fishes recognized by the American Fisheries Society.

** Includes recaptured fish during spring fyke netting.

*** Does NOT include mini-fyke net data.

Table 5. Spring fyke netting summary on Boot Lake between 2016 & 1996; Oconto County, WI.

2016 Fyke Netting (56*)			1996 Fyke Netting (41*)		
	Total	Mean Catch		Total	Mean Catch
Species	Catch	per net night	Species	Catch	per net night
Yellow perch	637	11.4	Yellow perch	411	10.0
Rock bass	172	3.1	Walleye**	307	7.5
Walleye**	70	1.2	Largemouth Bass**	40	1.0
Bluegill	54	1.0	Northern Pike**	24	0.6
Largemouth bass**	31	0.6	Muskellunge	17	0.4
Northern pike**	19	0.3	Rock Bass	16	0.4
Muskellunge	7	0.1	Bluegill	10	0.2
Black crappie	3	0.1	Pumpkinseed	1	< 0.1
TOTAL	**993**			**826**	

*Sampling effort in net nights for each corresponding year.

**Includes recaptured fish.

Table 6. Summer fyke netting summary on Boot Lake between 2016 & 1996; Oconto County, WI.

2016 Fyke Netting (18*)			1996 Fyke Netting (3*)		
	Total	Mean Catch		Total	Mean Catch
Species	Catch	per net night	Species	Catch	per net night
Rock bass	178	9.9	Bluegill	196	65.3
Bluegill	107	5.9	Rock Bass	35	11.7
Pumpkinseed	19	1.1	Largemouth Bass	3	1.0
Walleye	15	0.8	Northern Pike	2	0.7
Northern pike	10	0.6	Yellow perch	1	0.3
Black crappie	7	0.4	Walleye	1	0.3
Yellow perch	5	0.3	Pumpkinseed	1	0.3
Muskellunge	1	0.1			
TOTAL	**342**			**239**	

*Sampling effort in net nights for each corresponding year.

Table 7. Electrofishing summary from 2016 and 1996 at Boot Lake; Oconto County, WI.

	Spring electrofishing (SEI)						Gamefish/Panfish electrofishing (SEII)					
	2016 April			1996 May*			**2016 June**			1996 October		
	Total	**CPUE**	**CPUE**	Total	CPUE	CPUE	**Total**	**CPUE**	**CPUE**	Total	CPUE	CPUE
Species	**Catch**	**/hour**	**/mile**	Catch	/hour	/mile	**Catch**	**/hour**	**/mile**	Catch	/hour	/mile
Bluegill							**126**	**252.0**	**126.0**			
Yellow perch												
Northern pike	**11**	**5.5**	**2.9**	3		0.9	**5**	**2.7**	**1.3**	20	8.3	6.5
Walleye	**31**	**15.5**	**8.3**	159		45.4	**1**	**0.6**	**0.3**	217	90.4	70.5
Largemouth bass	**26**	**13**	**6.9**	19		5.4	**51**	**27.8**	**12.8**	37	15.4	12.0
Rock bass							**48**	**96.0**	**48.0**			
Pumpkinseed							**5**	**10.0**	**5.0**			
Muskellunge	**5**	**2.5**	**1.3**	1		0.3	**1**	**0.6**	**0.3**	1	0.4	0.3
Smallmouth bass							**3**	**1.6**	**0.8**			

*Sampling effort in hours not recorded.

Table 8. Fall electrofishing summary for Boot Lake; Oconto County, WI.

	Fall electrofishing													
	2009		**2010**		**2012 Oct.**		**2014 Sept.**		**2015 Sept.**		**2016 Oct.**		*1996 Oct.	
	Total	**CPUE**	**Total**	**CPUE**	**Total**	**CPUE**	**Total**	**CPUE**	**Total**	**CPUE**	**Total**	**CPUE**	Total	CPUE
Species	**Catch**	**/mile**	**Catch**	**/mile**	**Catch**	**/mile**	**Catch**	**/mile**	**Catch**	**/mile**	**Catch**	**/mile**	Catch	/mile
Walleye	**7**	**1.9**	**11**	**2.9**	**5**	**1.3**	**4**	**1.0**	**5**	**1.3**	**9**	**2.3**	217	70.5
Muskellunge			**2**	**0.5**	**1**	**0.3**			**2**	**0.5**	**8**	**2.0**	1	0.3

* Total catch included all walleye in 1996; future surveys targeted YOY, age-1, and age-2 walleye only.

Table 9. Current fishing regulations (2016 - 2017) for Boot Lake; Oconto County, WI.

Species	Fishing Season	Daily Limit	Minimum Length
Largemouth bass	May 7- March 5	5	14 inches
Smallmouth bass	May 7- June 17	Catch and release	
	June 18- March 5	5 in total with LMB	14 inches
Northern pike	May 7- March 5	5	None
Muskellunge	May 28 - November 30	1	40 inches
Walleye	May 7- March 5	3	18 inches
Panfish (bluegill, pumpkinseed, crappie, and yellow perch)	Open all year	25 in total	None
Bullheads	Open all year	None	None
Rock bass	Open all year	None	None

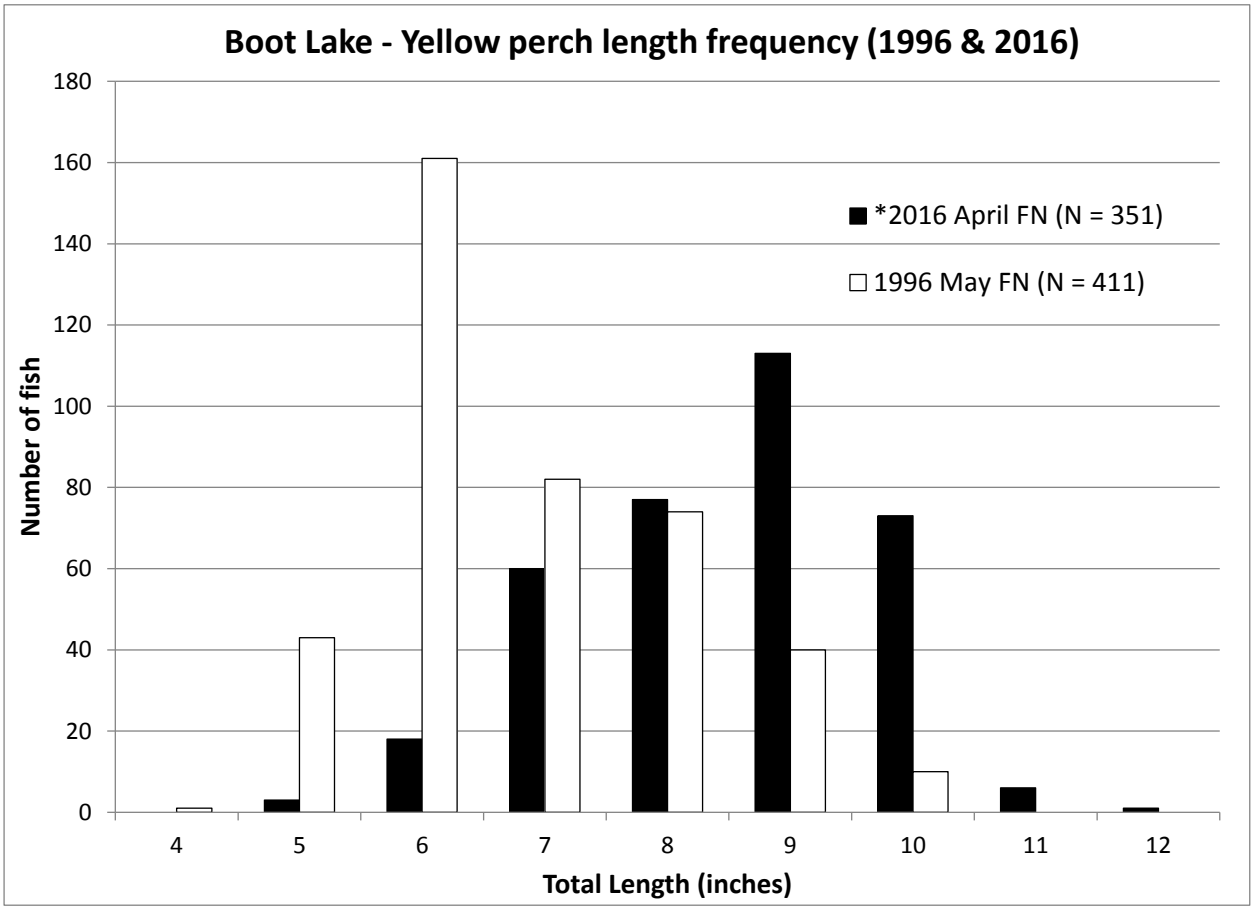
Table 10. Mini fyke netting summary from 2016 on Boot Lake; Oconto County, WI.

2016 mini fyke netting (8*)		
	Total	Mean Catch
Species	Catch	per net night
Bluegill	323	40.4
Bluntnose minnow	314	39.3
Rock bass	78	9.8
Largemouth bass	25	3.1
Green sunfish	7	0.9
Hybrid sunfish	5	0.6
TOTAL	**752**	
*Sampling effort in net nights.		

Table 11. Tribal harvest of walleye and muskellunge at Boot Lake from 1996 to 2016; Oconto County, WI.

	Number Harvested	
Year	Walleye	Muskellunge
1996	2	1
2002	65	
2003	57	
2004	53	
2005	76	
2006	56	
2007	25	
2008	81	
2009	50	
2010	64	
2011	4	
2012		
2013	13	
2014		
2015	72	
2016		
TOTAL	618	1

APPENDIX II – FIGURES



*Only 351 of the 637 perch collected were measured to reduce overcrowding and avoid handling mortality.

Figure 1. Yellow perch length frequency comparison at Boot Lake; Oconto County, WI.

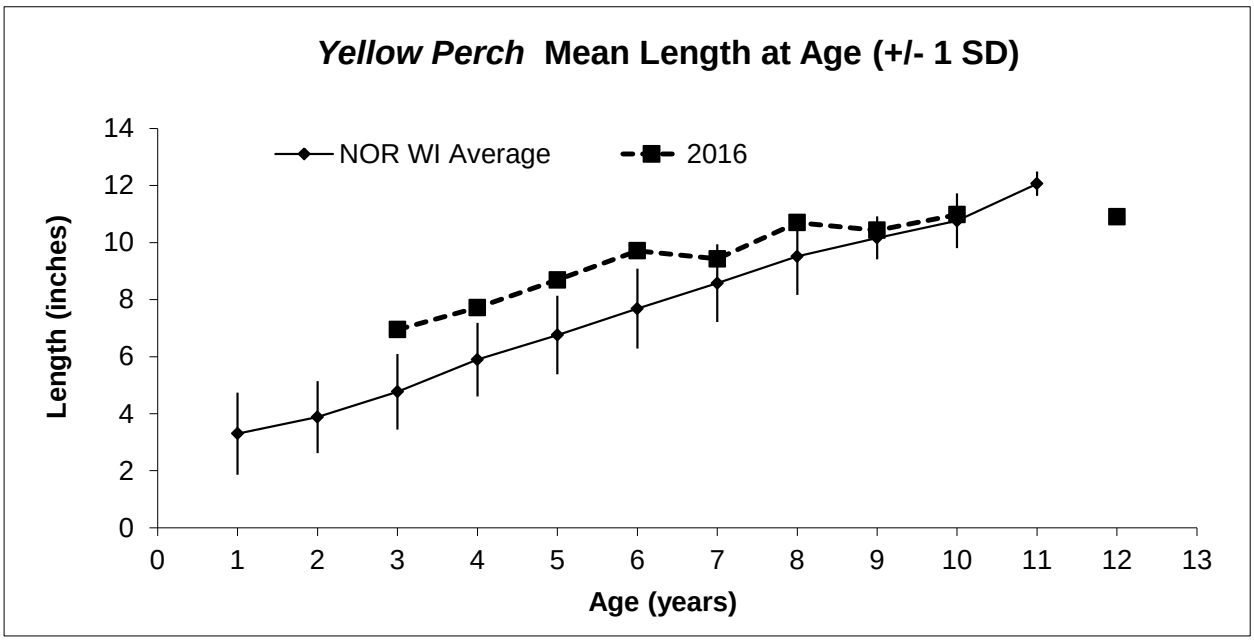


Figure 2. Yellow perch mean length at age comparison from Boot Lake; Oconto County, WI.

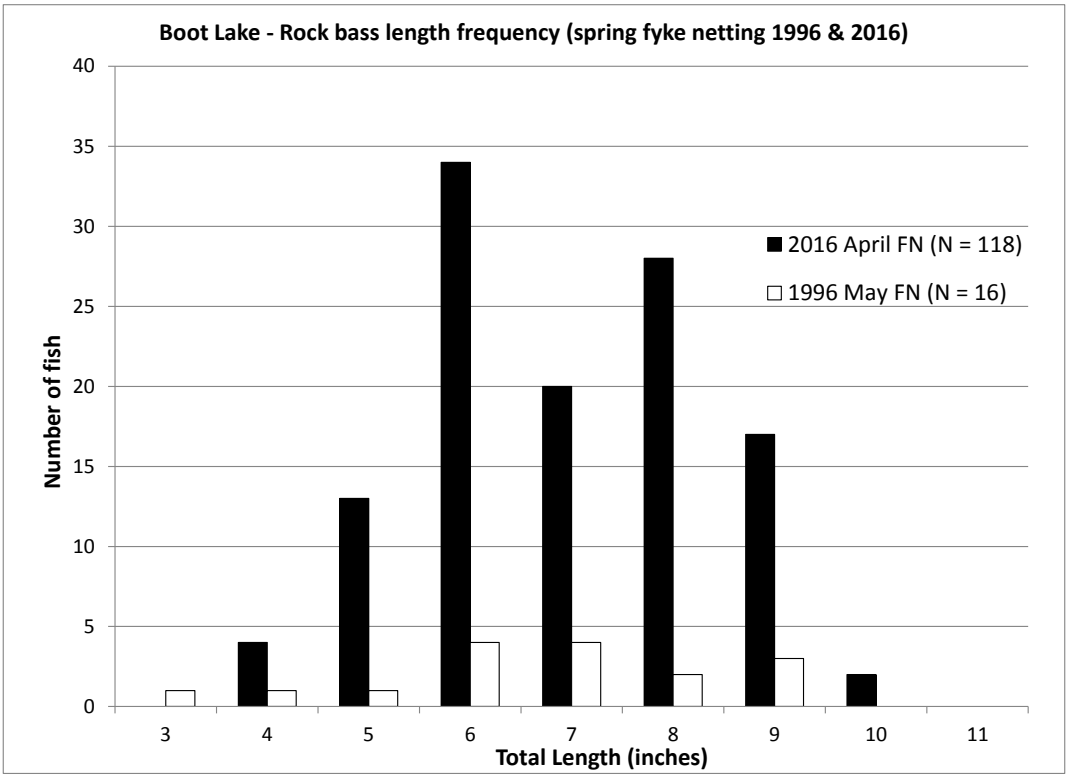


Figure 3. Rock bass length frequency comparison at Boot Lake; Oconto County, WI.

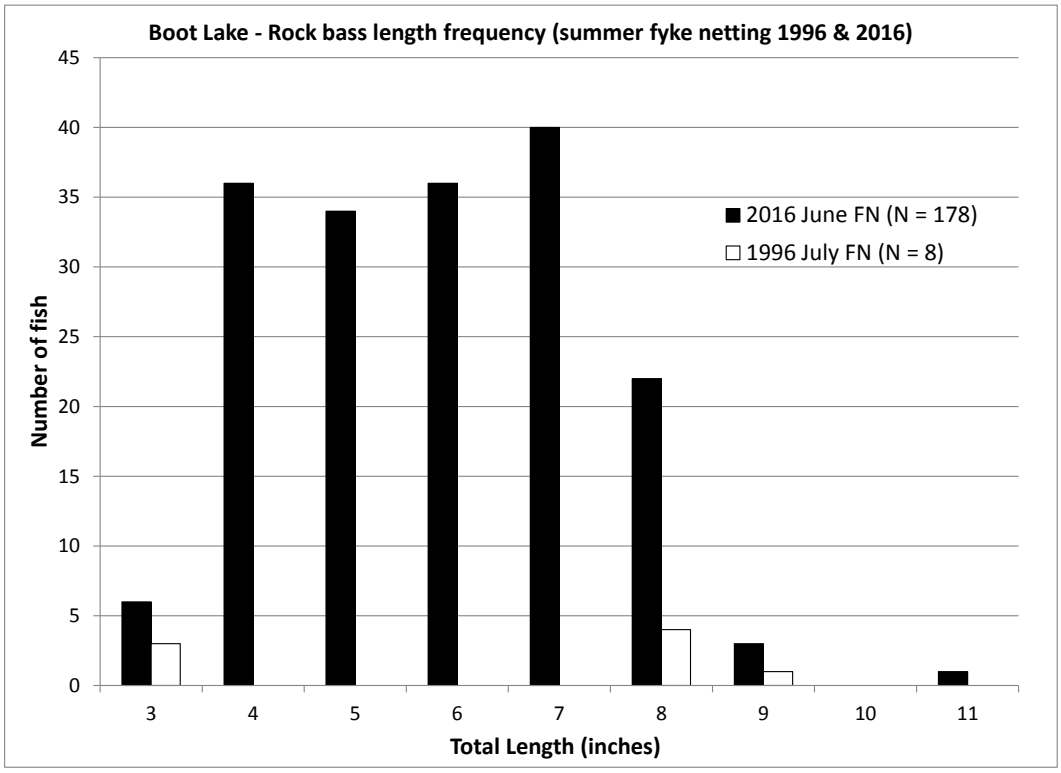


Figure 4. Rock bass length frequency comparison at Boot Lake; Oconto County, WI.

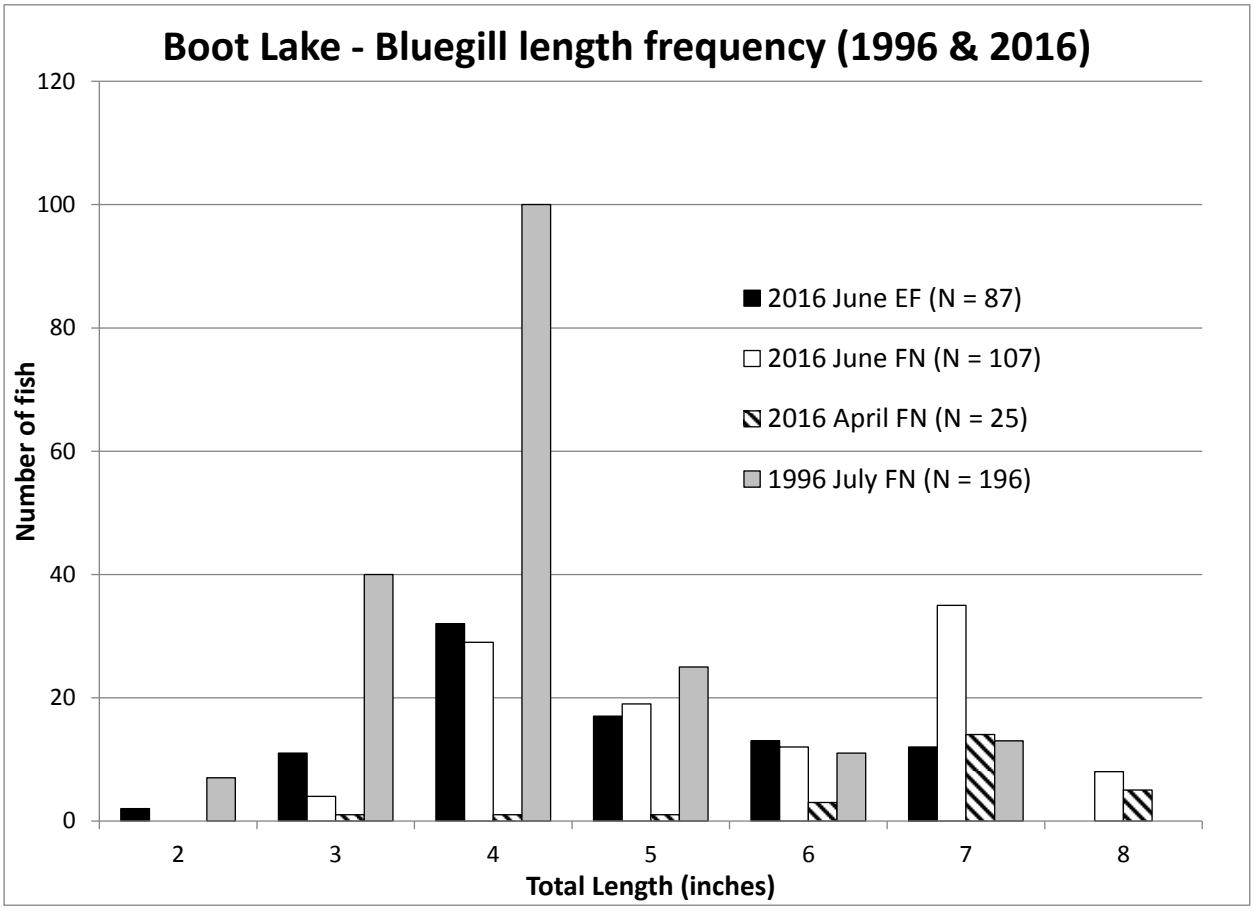


Figure 5. Bluegill length frequency comparison at Boot Lake; Oconto County, WI.

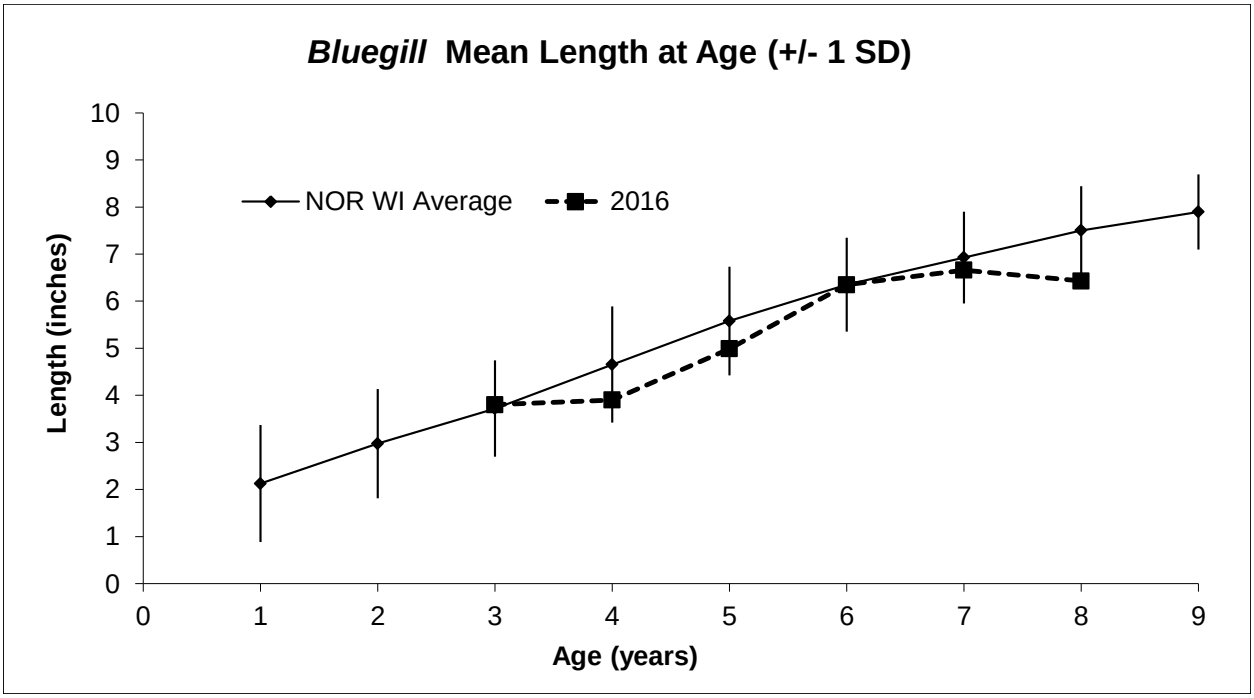


Figure 6. Bluegill mean length at age comparison from Boot Lake; Oconto County, WI.

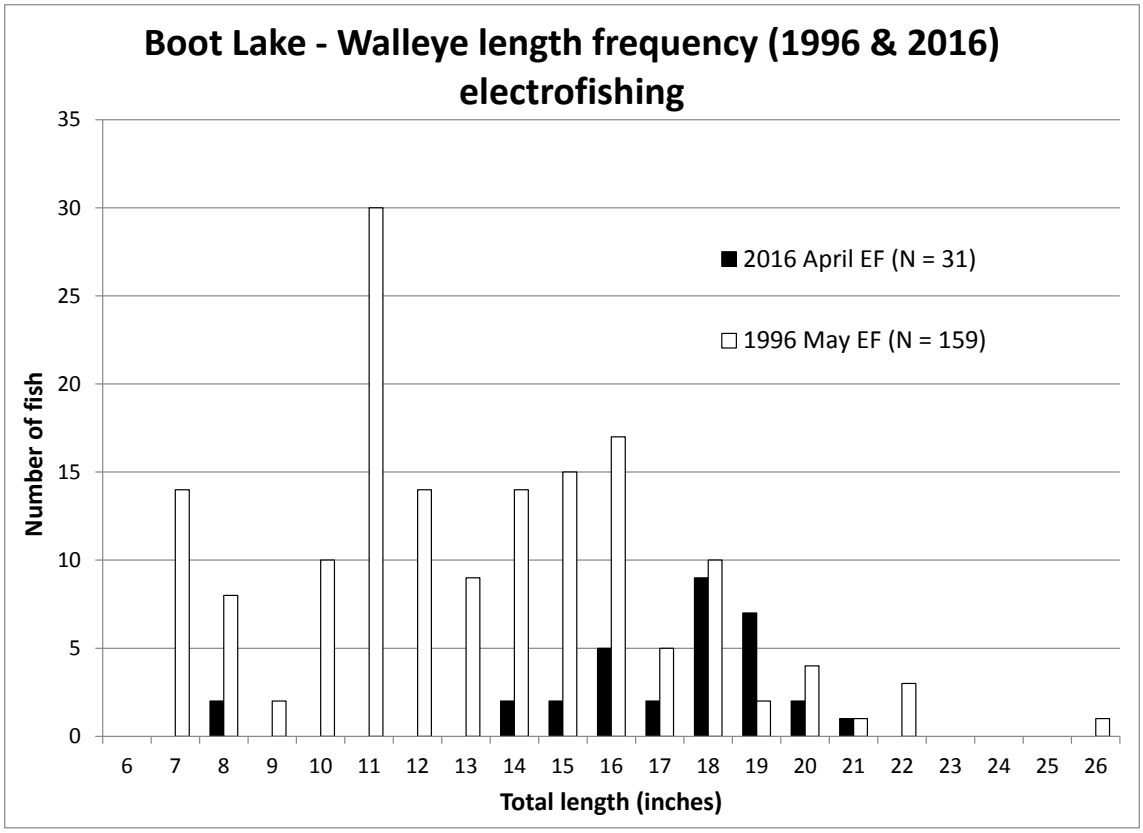


Figure 7. Walleye electrofishing length frequency comparison at Boot Lake; Oconto County, WI.

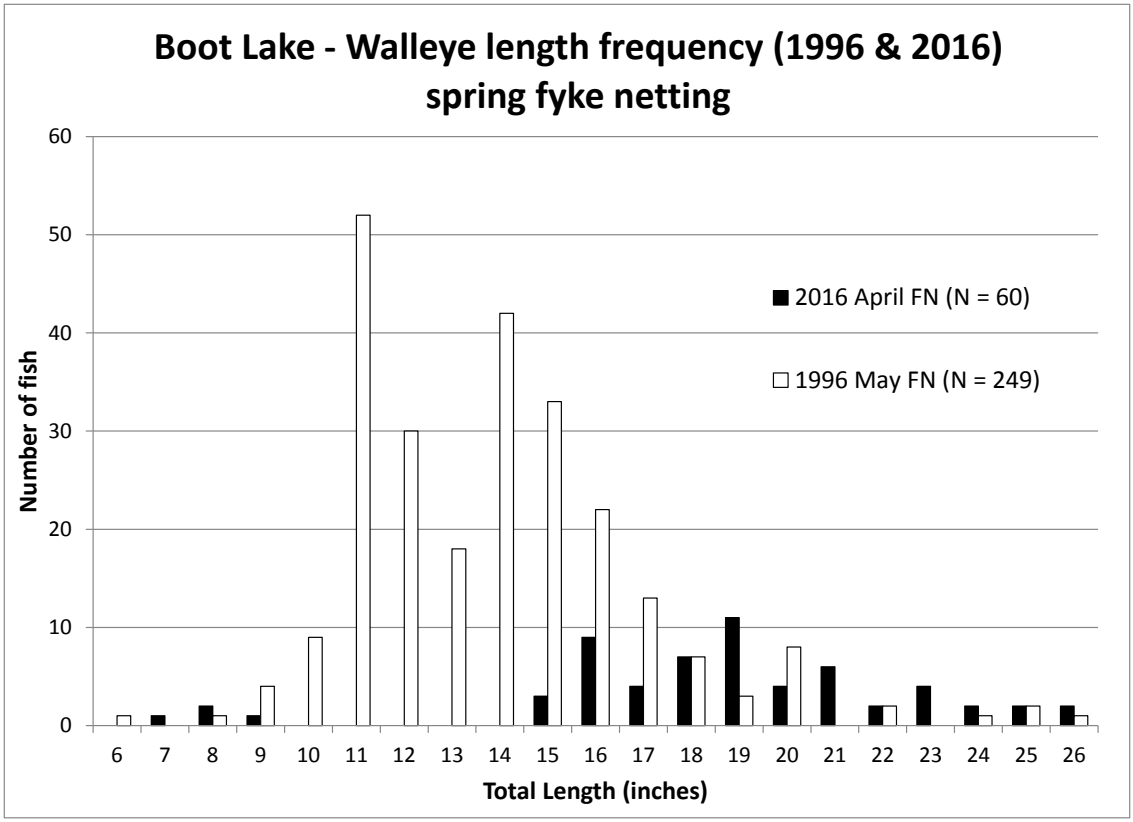


Figure 8. Walleye fyke netting length frequency comparison at Boot Lake; Oconto County, WI.

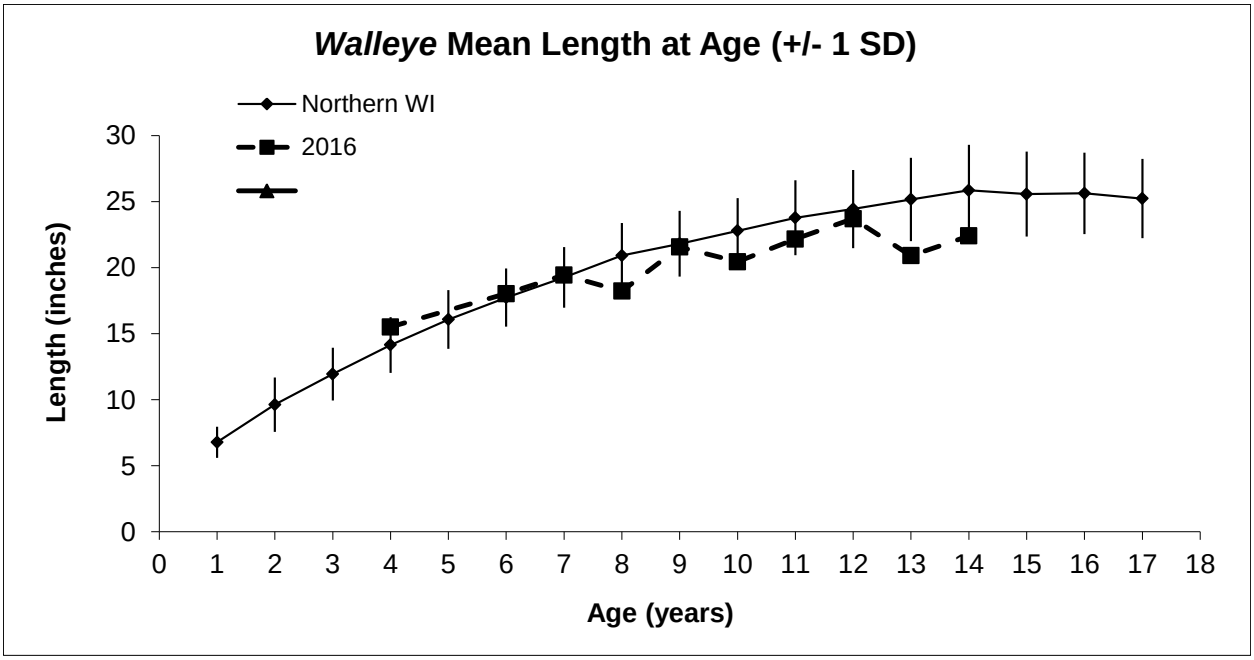


Figure 9. Walleye mean length at age comparison from Boot Lake; Oconto County, WI.

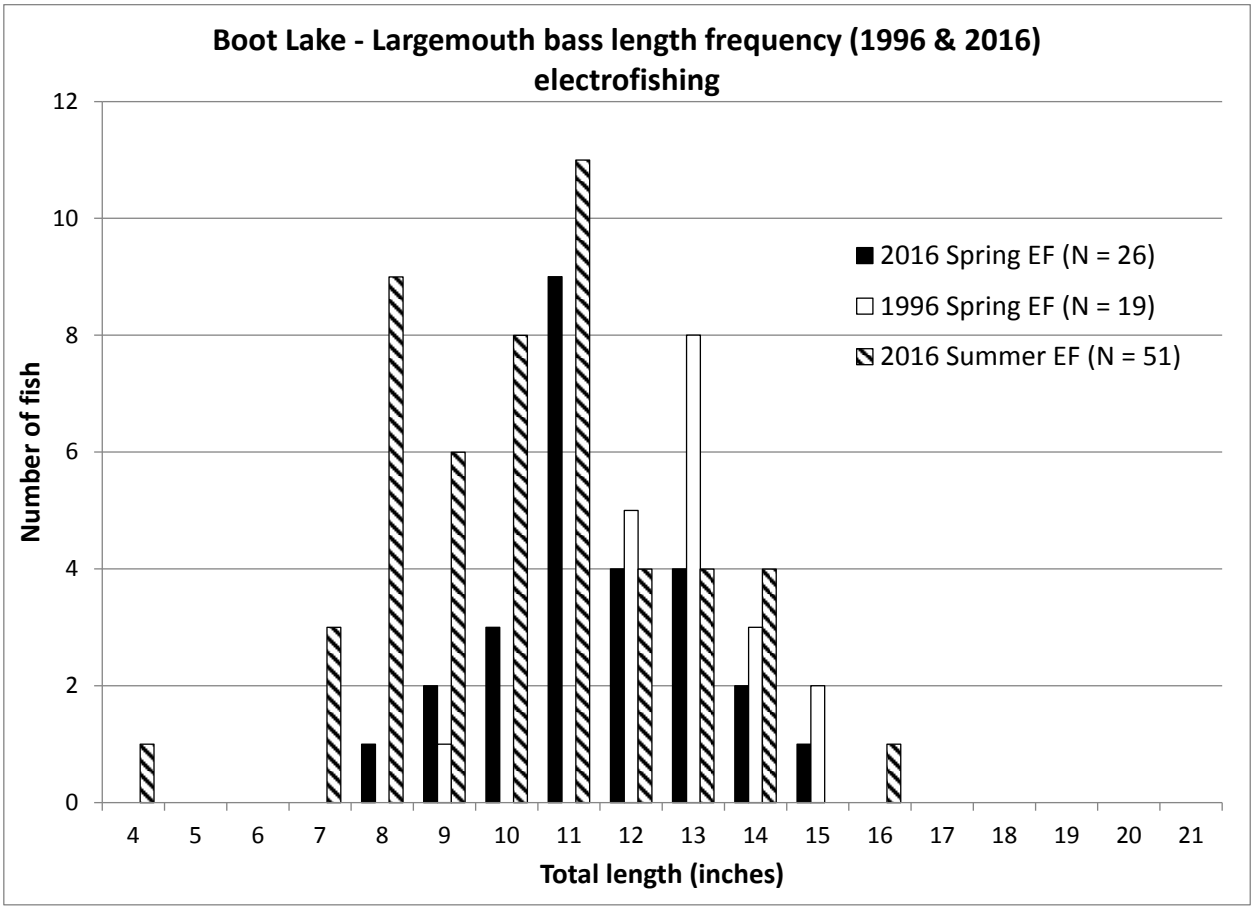


Figure 10. Largemouth bass electrofishing length frequency comparison at Boot Lake; Oconto County, WI.

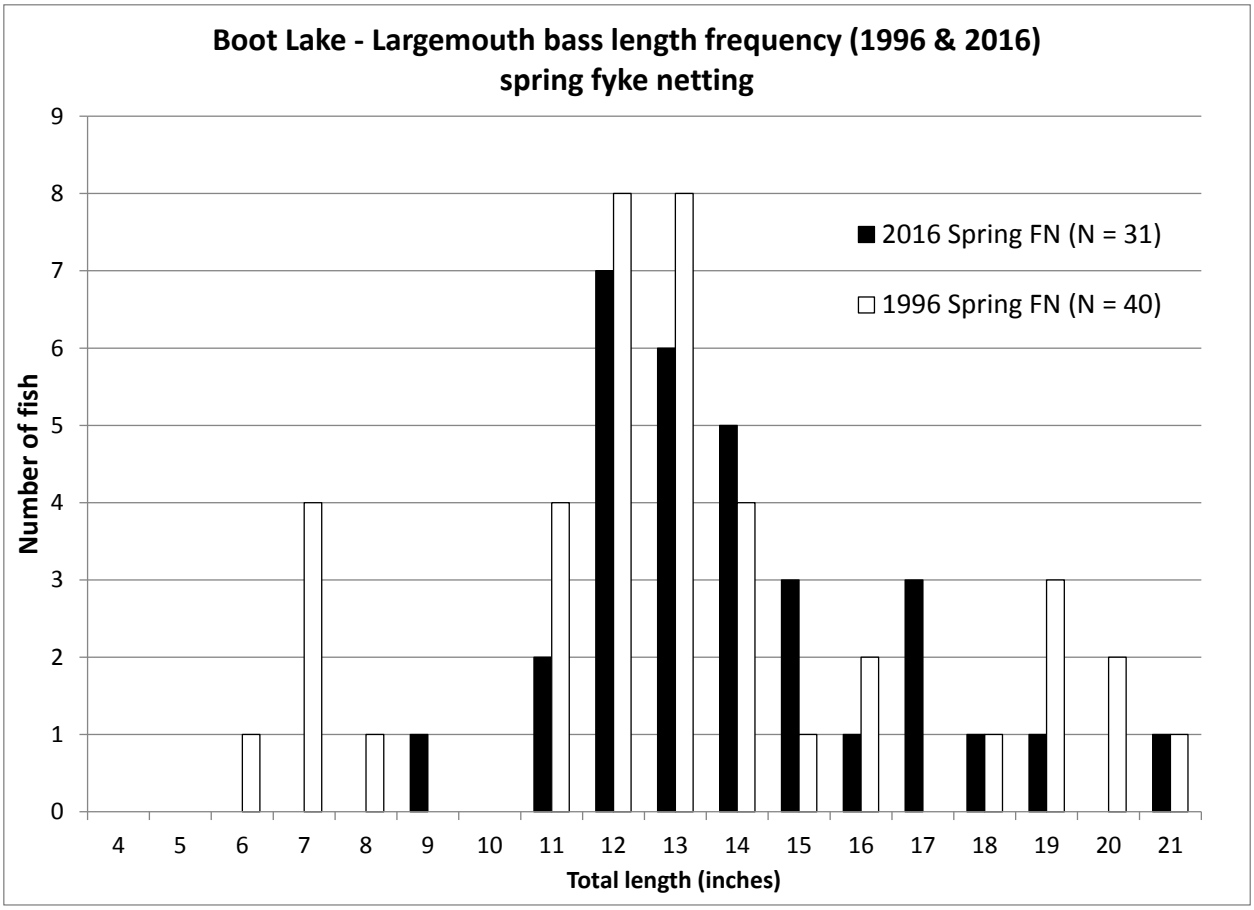


Figure 11. Largemouth bass fyke netting length frequency comparison at Boot Lake; Oconto County, WI.

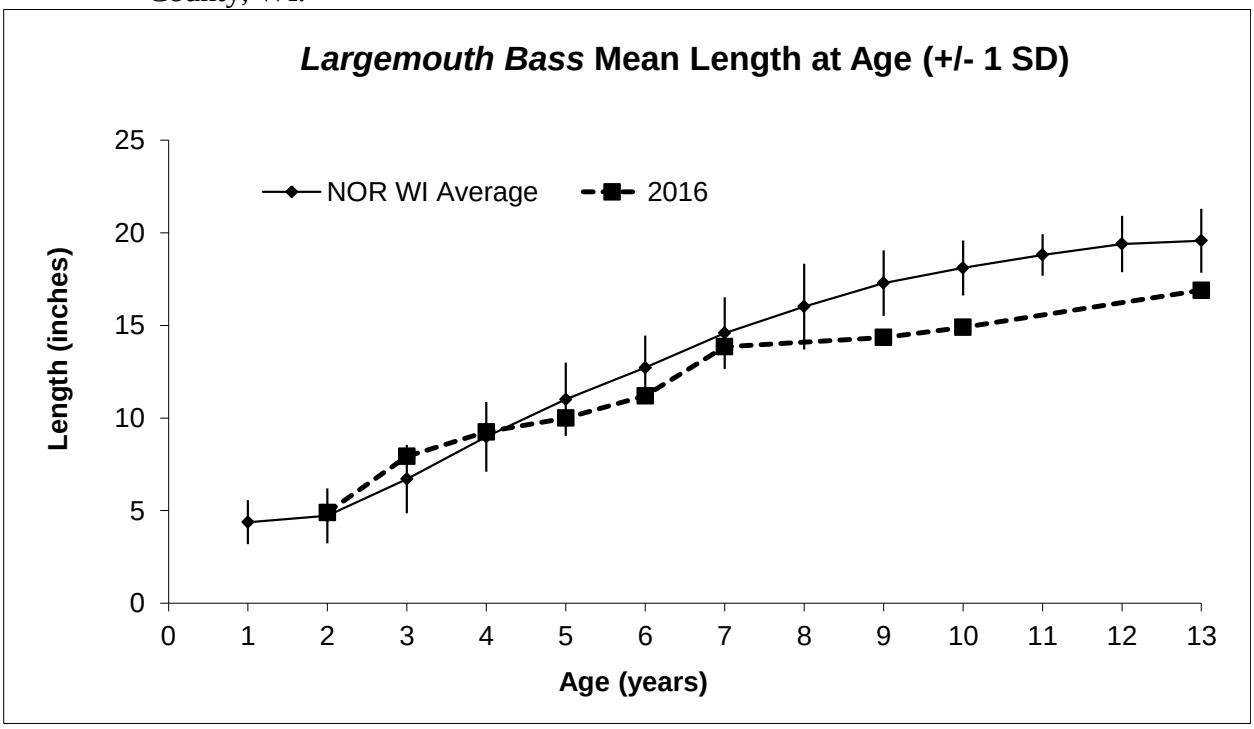


Figure 12. Largemouth bass mean length at age comparison from Boot Lake; Oconto County, WI.

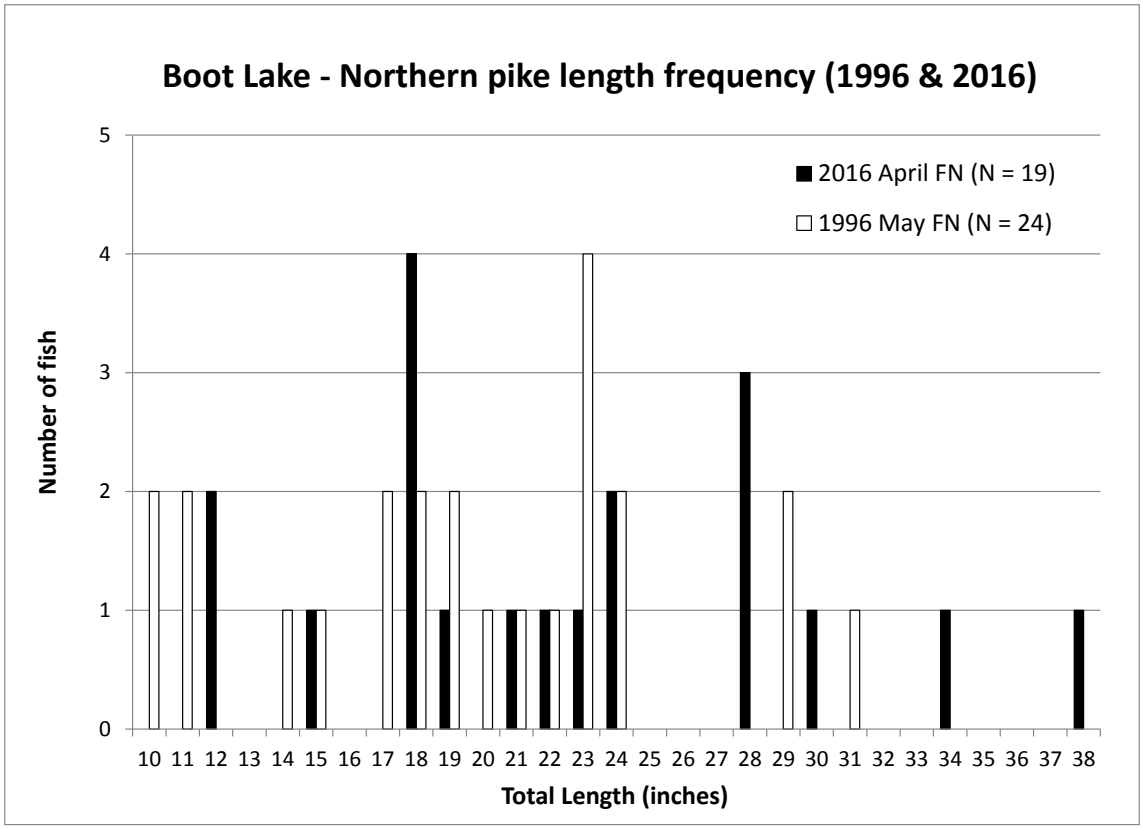


Figure 13. Northern pike fyke netting length frequency comparison at Boot Lake; Oconto County, WI.

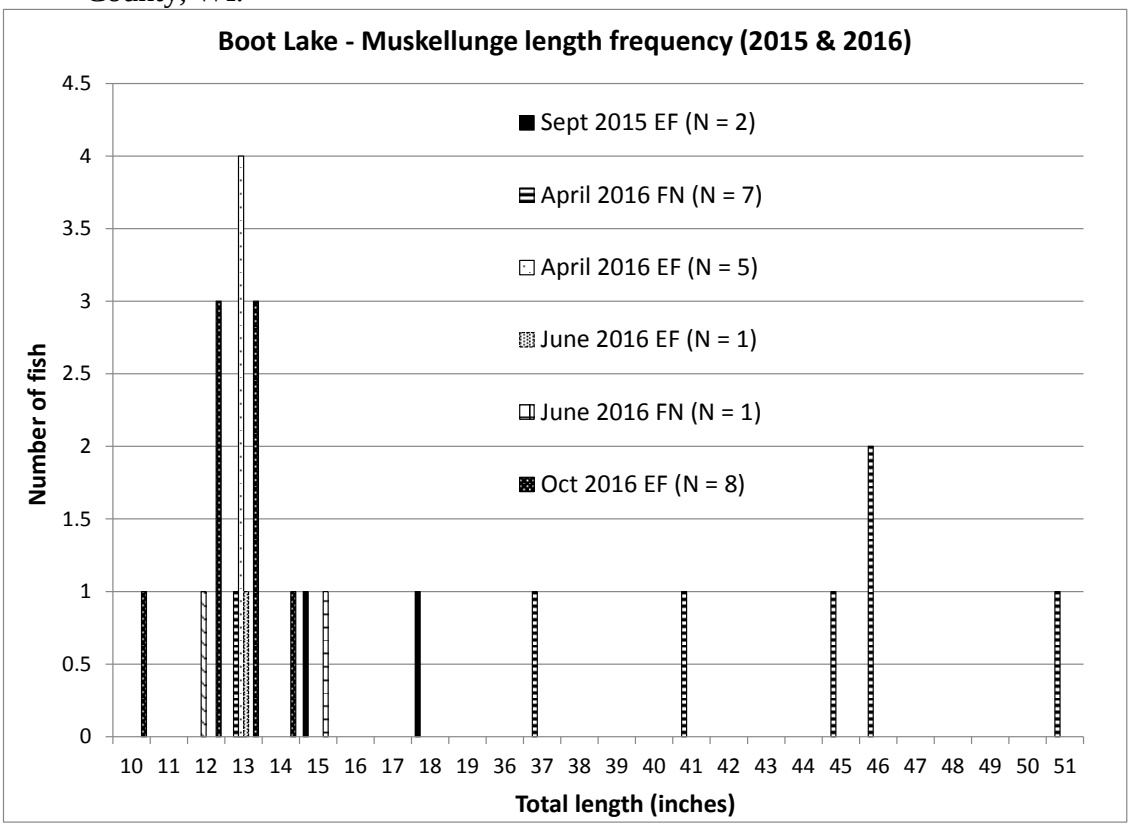


Figure 14. Muskellunge length frequency summary from Boot Lake; Oconto County, WI.

APPENDIX III – SAMPLING LOCATIONS

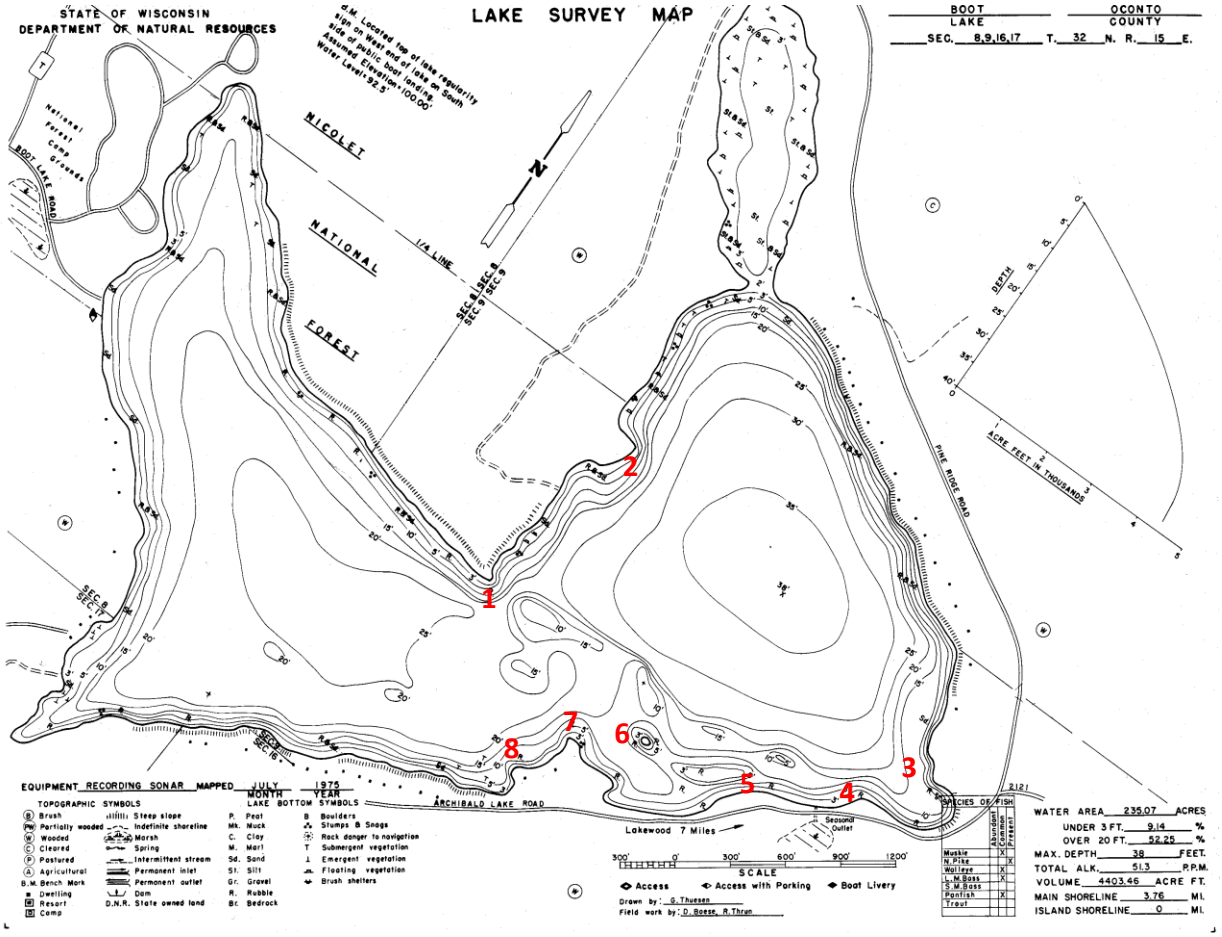


Figure 15. Fyke net locations during the 2016 comprehensive survey of Boot Lake; Oconto County, WI.